19 June 1956

MEMORANDUM FOR RECORD

SUBJECT: WS 117L Meetings

1. 12 June 1956. Meeting at AC Spark Plug, Milwaukee, Wisconsin with Mr. Bruce Schwartz (AC), Mr. R. E. Ayers (AC), and Mr. John Schultz (AC) with Mr. E. V. Stearns (Lockheed), Mr. Forrest Houston (MIT), Dr. J. E. Delisle (MIT), Mr. F. K. Guenthner (WADC), Lt. W. O. Covington (WADC), Lt. M. R. Malecomson (WADC), and Lt. J. C. Narther (WDD).

a. Purpose of Meeting: Investigation of WS 315A Guidance for WS 117L application to make use of components or complete platform as developed items.

b. The design goal of WS 315A is 1 mile CEP @1500 n.mi. range due to guidance system only. Total weight of system is approximately 600#. Platform contains (3) 10^7 gyros @ 12# and (3) 10^4 integrating accelerometers @2# with a total weight of about 325# with an additional 60# for shock mounts. Errors on burnout velocity magnitude and direction are approximately 1/30,000 and 1/2 minute of arc respectively (30 sec or 1/120° or .145 mr).

c. RCA (315A autopilot contractor) is using 10^5 Honeywell gyros, rate and integrating for IRBM autopilot.

d. AC could not undertake any WS 117L engineering or do any R&D on any other components, although the possibility of obtaining "off-the-line" components or platforms seems possible. Due to the prohibitive weight of the system, AC does not appear promising as a potential WS 117L guidance system contractor either for 10^7 gyros or platforms but the 10^4 accelerometer might be investigated further.

2. 13 June 1956. Meetings at GE, Syracuse with Mr. Ben Walker (GE) Les Pauley (GE) and others (GE) with the same group as at AC except for Houston.

a. Purpose of meeting: Investigation of SM 65 Radio-inertial guidance for WS 117L application. Three items make this scheme of ARS guidance particularly interesting:

(1) Because of the high priority, it is felt that this system will have a tremendous push ($) to have it available as usable equipment with the Convair Missile, as it must be designed and tested to operate in the SM65C environment. Thus efficient use will be made of this large R&D program.

DOWNGRADED AT 12 YEAR
INTERVALS; NOT AUTOMATICALLY
DECLASSIFIED. DOD DIR 5200.10

(2) If early ARS launchings are made at AFMTC or a west coast IOC site, ground guidance stations will be available for the launching.

(3) The fact that an ARS satellite launching will be more nearly identical with an IOC training launching through the use of radio-inertial guidance might serve as an additional incentive for a joint WS 107A IOC-WS 117L launching. Thus, satellite orbiting launches could be performed for the most part by WS 107A crews, effecting an additional saving to the WS 117L program and additional priority on booster availability.

b. The foregoing remarks are based on the assumption that the GE system can place our satellite vehicle on a very precise "ascent into orbit" trajectory, and that the WS 117L vehicle possess such additional guidance as required to attempt to place it in a nearly circular orbit. In the early WS 117L vehicles of approximately 3500# gross weight, a velocity increment of the order of 3500 FPS is required at ascent trajectory apogee for a circular orbit at 300 miles whose required velocity is 25000 FPS. Since this is a fairly small percentage of the total, a fairly "crude" system might be used and a reasonably circular orbit achieved. This system might consist of gyro stabilized reference and a computer to determine the magnitude, direction, and time of application of the orbital boost. Large errors in this would not appreciably affect the total velocity magnitude and direction errors, which ultimately determine the ellipticity of the orbit.

c. Discussion at GE concerning the FPS-17 radar, which is being developed for WS 117L, because of need-to-know, could not be pursued, but our requirements of tracking range, etc., seemed to arouse enthusiasm from the GE people and further contacts were arranged.

3. 14 June 1956: Meeting at Reeves Instrument Company at New York City and Garden City, Long Island, with Mr. Raleigh McCoy, Mr. John Ryman, Mr. Norman Bloomenstein and others from Reeves with the same group that was at GE.

a. Purpose of meeting: To get an idea of the capabilities of Reeves to supply 10^7 gyros, 10^4 integrating accelerometers, and/or complete platforms or systems designed by MIT or an inertial extrapolator as would be required if the GE system is used to ICBM booster separation from the ARS vehicle.

b. Capability: Reeves has a contract with the Navy to produce fourteen (14) 10FG gyros (10^7) for Jupiter with the hope of continuing production. These are to be made to MIT drawing and specs. Having worked closely with MIT for ten (10) years, a smooth working relationship has evolved and Reeves is currently making the following components:

10^3 Flight Control Gyros (MIT specs)
10^4 Integrating Gyros for Convair autopilot with accuracy of 1/3000 on 600 FPS.
10^4 Integrating accelerometers (pendulous integrating gyros) (PIGS)
10^5 H105 gyros for Hughes Aircraft.

Typical production rates are:

10^4 gyros - 40/month
10^4 pigs - 18/month later 45/month

On the 10^7 units being made for the Navy, the following lead times are scheduled:

After 6 months - tooling completed
After 8 months - test equipment ready
After 9 months - production begins
After 15 months - capability for 5 units/months

Vibration specification on 10^7 is approximately:

16g - 500 CPS
10g - 1000 CPS
5g - 2000 CPS

Drift rate - .1 Dyne CM. or .01 Mil/sec or 2°/hr

c. Reeves is also developing a Bomb Scoring System for Rome Air Development Center (Joe Pallik) which is to be carried in an aircraft bomb bay. Acceleration data taken off of the stable platform will be telemetered to a ground radar to remove the lag in the track radar due to acceleration of the target.

The system consists of a platform to be mounted in a cylinder 18" in diameter by 18 ft long which uses (3) HIG4 gyros and (3) Sanders accelerometers (null changes with everything). A change to MIT designed 10^3 pigs is contemplated or for our purposes the MIT designed spherical float 10^4 pig weighing 7.5# would be adequate which would make the platform about 1/3 larger and heavier than the 52.1# for the platform and about 20# for associated electronics not including the power supply at the present. Power requirements are about 100 watts for amplifiers and 200 watts for heater power. Drift rate is of the order of 2°/hr. at present.

The platform was not designed to minimize weight, although the gimbals are I beam type cross section. This unit is ready for assembly.

d. Reeves expressed interest in proposing to Lockheed Aircraft Corporation on the extrapolator and present a capability. They are now moving their entire production to Garden City and have an excellent facility which was laid out and coordinated with MIT using similar production techniques. If MIT developed a system around their 2 x 10^6 gyro, approximately 18 months lead time would be required by Reeves to produce the first system (guess by Reeves and MIT).

4. Lockheed and WDD expressed interest in their modified SCR 584 (almost completely new system according to McCoy) which is being supplied to Patrick in the near future. More contact and information on this were arranged for a later date. Reeves also asked if there would be much ground electronic equipment associated with WS 117L and expressed an interest in taking part in it.

SIGNED

JOHN C. HERCHER
1st Lt, USAF
WS 117L Office
Technical Operations